1986/87 UPDATE

Salmonid Enhancement Program

88-02955/

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SEP Expenditures by Program
(in thousands of dollars)

Program Area	1985/86	1986/87
Major Production Projects (construction)	$ 5,017	$ 3,075
Minor Production Projects	2,391	2,350
Pilot Studies	1,597	287
Enhancement Operations/Maintenance	14,472	17,557
Community Development Projects	4,398	4,264
Lake Enrichment	2,365	2,370
Public Involvement	1,416	1,418
Reconnaissance/Feasibility Studies	1,557	604
Manageability/Environmental Studies	667	338
Evaluation/Assessment Studies	975	859
Research Studies	640	2,568
Program Planning and Direction	580	559
Canada/U.S. Operations/Maintenance	375	1,656
Provincial Program (Federal share)	645	477
Provincial Program (Provincial share)	1,500	1,470
TOTAL	$38,595	$39,852
Source of Funds		
Dept. of Fisheries and Oceans	37,095	38,382
Provincial share	1,500	1,470
TOTAL	$38,595	$39,852

Fisheries and Oceans / Pêches et Océans

BC Ministry of Environment and Parks

Canada

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Salmonid Enhancement Program
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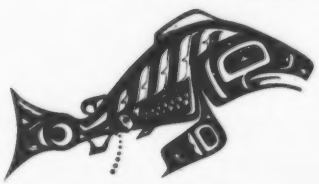


The year in review

Salmonid enhancement's role in Canada's Pacific fisheries management has received increased emphasis over the past few years as fish from enhancement activities begin to make a significant contribution to the catch. SEP forms an important cornerstone of fisheries management's efforts to rebuild stocks and to take full advantage of the provisions of the Canada-United States fisheries' treaty. This is reflected in the government's ongoing commitment to SEP. At the same time, SEP has been affected by government wide deficit reduction measures and must continually strive to extract the maximum benefit from every dollar spent. Achieving a balance between these factors has been a major theme in 1986/87.

By a restructuring of some activities and improvements in efficiency and effectiveness throughout its operations, SEP was able to maintain operations with minimal disruption while efforts continued to obtain long term funding for the program.

Response to the Auditor General's comments on the Department as a whole and his emphasis on control of capital assets consumed a great deal of time and effort in 1986. Staff was also challenged by the impact of SEP's takeover of operations, such as the Weaver Creek spawning channel and the Hells Gate fishway, previously managed by the International Pacific Salmon Fisheries Commission. The successful integration of these operations was one of the major achievements in 1986.

Adult returns to existing SEP facilities have been generally on target in 1986. There were some exceptions in areas where unusually low water flows last fall kept fish out of the rivers but most projects have met expectations. The program has continued a trend towards more semi-natural projects, such as spawning channels, where operating costs can be minimized. Habitat improvement projects carried out by government staff, contractors and volunteers are numerous.

The program's responsibility to inform and educate the public has also received attention. The Public Awareness Campaign, *Our Resource*, operated in seven B.C. and Yukon communities in 1986. More than 33,000 people were given the opportunity to learn about the salmonid resource, the Department's management role and the vital part the public can play in conservation and enhancement. Less costly communication activities were also undertaken. The booklet, *The Incredible Salmonids* was updated and re-issued and a new version of the popular pamphlet *Where and When to See Salmon* was published early in 1987. It provides an indication of the increase in all enhancement activities since 1977, listing 50 facilities and also making reference to the more than 200 public involvement projects operated by volunteers.

SUCCESSFUL INTEGRATION OF SALMON COMMISSION OPERATIONS WAS A MAJOR ACHIEVEMENT IN '86

A milestone occurred in October, 1986, when the Salmonid Enhancement Task Group marked its tenth anniversary. This group's dedication has been a source of ideas and inspiration for the program since its beginning. Such commitment, from government, management, staff and the public will continue to guide SEP into its second decade.

H. Swan
Director, SEP

Fighting the Atnarko floods

The Atnarko River, in the central coast of B.C., supports a large and important pink salmon stock. Unfortunately, severe floods that can damage the spawn are fairly common on the river. As a result, major fisheries historically occurred in only three or four years out of 10.

Previously, the Atnarko has also had an abundance of chinook that supported a gillnet fishery and a good tidal and river sport fishery. Over time, the chinook stock declined to the point where the gillnet fishery was closed and the sport fishery reduced to about 20 percent of its previous level. The situation caused serious concern to fisheries managers.

A committee of members from Fisheries Branch, SEP and the provincial Fisheries Branch set about finding a solution to this problem. The group put forward two suggestions. The first was to create a small, floodproof spawning channel for pink salmon. Able to handle 50,000 spawners, the channel could produce about 250,000 adults for the fisheries. The additional benefit would be a faster rebuilding — one or two cycles instead of three or four — if there were disastrous floods. The second suggestion, for chinook, proposed an expansion of the incubation and early rearing capacity at Snootli Creek hatchery and the addition of final rearing capacity adjacent to the Atnarko pink channel.

The decision to proceed with the project was made in 1984 and SEP began to seek a suitable site. One was found about two kilometres upstream of the junction of the Talchako and Bella Coola Rivers. The major concern was that this site was within Tweedsmuir Provincial Park and the proposal could be rejected by Parks Branch. This had happened with a similar proposal in 1974. Negotiations for a Park Use Permit were undertaken in 1985 and initial approval was obtained. Federal and provincial agencies held a design workshop to further develop the proposal in June, 1985 and conducted public meetings at Bella Coola in March, 1986. The Park Use Permit was issued in April, 1986 and work proceeded in May.

First, a cofferdam had to be placed to protect the excavation site. Just as that was done, the Atnarko lived up to its reputation with a sudden rise that nearly took out the cofferdam. Had the site been flooded, construction would have been delayed or cancelled for the year. Only a supreme effort by local contractors with direction from SEP Engineering secured the cofferdam so that construction could proceed. The major spawning channel and rearing channel contract was let in June, 1986.

To maintain a natural setting, the route of the pink spawning channel was carefully selected to leave as many trees as possible. Two additional channels, 300 metres total length and six metres wide, serve as chinook rearing ponds. The pink spawning channel measures 1400 metres in length and is 18 metres wide.

The channels receive water from culvert pipes connected to a fabricated steel box intake set into the riverbank. Three sluice gates at the upstream end control the flow and the entire site is protected by a setback dyke.

The spawning channel was completed in August, 1986, and the first 15,000 pinks entered it in September. Several hundred chinook and coho plus a few steelhead were also seen spawning in the channel.

Since the completion of Phase I, a groundwater well has been drilled to provide warm water for de-icing the intake and to supplement the rearing water for the chinook ponds. An aeration tower and divider structures for the channel have been added and work for 1987 includes cutting a public walking trail, providing parking and installing information kiosks.

"The Atnarko River project involved many agencies whose cooperation contributed to its success," says Otto Rapp of SEP Engineering. "Specifically, the help of our fishery officers, the Fisheries Branch, the Ministry of Environment and Parks and the Ministry of Transportation and Highways should be acknowledged." ■

Bella Coola expands with transported chinook

The ultimate purpose in producing more fish is to produce more fishing opportunities. The expansion of the operation at Bella Coola and its access to rearing at the Atnarko site will help to create those opportunities in the central coast area.

The Snootli Creek hatchery expansion can provide increased chinook to the Atnarko system. Plans for such an expansion had to

overcome problems, however, with water sources at Snootli Creek. The well water supply was limited and the surface water supply was comparatively cold.

"We could expand the Snootli site for incubation and early rearing," says Cam West of SEP Operations, "but to attain the capacity we knew we wanted for final rearing of chinook we would have to find another site."

The answer was found in a fry transport operation. The Snootli Creek site was expanded with new wells, incubation facilities and an aeration system. The fry are incubated and given early rearing there, then moved by tank truck some 64 kilometres to the rearing channel at the Atnarko site.

"The chinook expansion had a design target of five million Atnarko chinook smolts," says Cam West, "but we decided to maintain production at two million for one cycle to allow time for assessing the impact of increased numbers on the wild stocks. We will also have the capability of rearing up to one million additional chinook smolts from other stocks, to provide a balanced enhancement effort."

The new incubation facility was to receiveits first eggs in September, 1987. By the time the fry are ready for moving the new rearing channel will be ready for them.

If the production of Atnarko chinook increases as expected, these fish may allow for reopening of the gillnet fishery and provide a bonus. They could provide an alternative to steelhead sport fishing in the area.

The construction work at Snootli was carried out with the ultimate egg target in mind. If the assessment indicates a successful operation with the chinook project, the design target of five million smolts can be attained without major refitting. This could mean a brighter time ahead for all central coast fisheries. ■

Building a sport fishery on the Chilliwack

The Chilliwack River is one of the most popular sport fishing rivers in B.C. Already known for steelhead and enhanced coho, it attracts anglers from the Lower Mainland and visitors from the rest of Canada and the USA. One thing that has been lacking, however, is an early run of chinook. In an effort to establish a summer fishery on the system, the Department has been transplanting red fleshed early-run chinook from three upper Fraser River stocks.

All transplants must be approved by the Transplant Committee which examines proposals for biological soundness. Such factors as predation, competition and disease or parasitic infection must be considered. Approvals have been granted for the Chilliwack project and transplants were undertaken in 1985 and '86. They will continue for three more years to establish viable populations of one or more of the three stocks.

Enhancement on Chilliwack River produces dividends for an active sport fishery through much of the year. Existing coho, chinook and steelhead runs may soon be augmented by early-run chinook from a new transplant effort.

The stocks selected for this project, largely on the basis of timing and genetic diversity, were from the Bowron, Slim and Quesnel systems.

"By transplanting a number of different stocks to the Chilliwack system," says Ted Perry of SEP Operations, "we are

hopeful that at least one will be successful in establishing itself in the Chilliwack watershed."

In all cases, the eggs are incubated to eyed stage at the Quesnel hatchery. They are then moved to the Chilliwack facility, hatched and reared for release to the river.

If all of the transplants establish themselves in the Chilliwack, the final result would be a succession of runs to the river, starting with chinook that enter the mouth of the Fraser in May and June and leading up to the existing fall run of chinook which now enter the river in August.

The early survival rates have been good and it is hoped that eggs from the first returns will be available to continue building the runs after the first five or six years of the project.

With the number of anglers wanting to fish the Chilliwack, the benefits from this project, especially to the local economy, could be very substantial indeed. The benefits to Lower Mainland sport fishing enthusiasts would be immense. ■

Answers appear on a tiny wire

A coded-wire nose tag is 1.2 mm long, about 1/10 the length of one of your fingernails, but it carries an amazing amount of information. When one of these wires is removed from the head of a SEP-produced fish, a coded message etched into the wire tells staff at the Mark Recovery Program which hatchery produced the fish, its species, its year and place of release. Wild smolts can also be tagged. They are caught as they begin their downstream migration, tagged and released. Coded-wire tags provide valuable information later, when the fish have been caught and the tags removed.

There are three distinct elements to the recovery program for tagged heads. One is sampling of the commercial catch, carried out by DFO staff. Representative samples are taken from landings at locations throughout the province. The second element is the voluntary return of heads from the recreational fishery. Heads of adipose-clipped fish are accepted at any of the 234 head depots in the province. The final element is checking of fish actually on the spawning grounds, carried out by fishery officers, biologists, CEDP project workers or Public Involvement volunteers.

This is a complex process; inserting nose tags and clipping fins then later recovering heads, locating the tags and decoding them — not to mention compiling and analysing all the data. It is, however, essential to both good fisheries management and to proper planning and operation for SEP.

Mark recovery statistics provide answers to a lot of questions: Are some species showing higher or lower than historic survivals? Are some stocks within a given species performing better or worse than the others? Are the fish of a particular species following standard migration routes and timing? Are fish from one hatchery doing better or worse than expected? What portion of the commercial and sport catches is made up of SEP-produced fish?

Statistics from the 1986 Mark Recovery Program provide answers to these questions — and others. The program received 66,197 heads in 1986. Of these, 40,442 were from the commercial catch, 12,414 from the sport fishery and 13,341 from fish on the spawning grounds.

Technicians, using magnetic detectors, recovered 57,718 coded-wire tags in 1986 and took down the information etched on them. Of all heads examined, 12.8 percent (8,479) did not contain pins and 0.4 percent (245) of the pins were lost during dissections.

The number of heads recovered in 1986 was up eight percent overall from 1985.

The numbers of commercial heads showed the greatest increase (28,259 in 1985) but a decline was apparent in sport recoveries (15,918 in 1985). Many anglers are, however, aware of and impressed by the program.

"I like getting all the information about my fish from them," says Anthony Stobbart. "Besides, there's always that chance to win on the draw!"

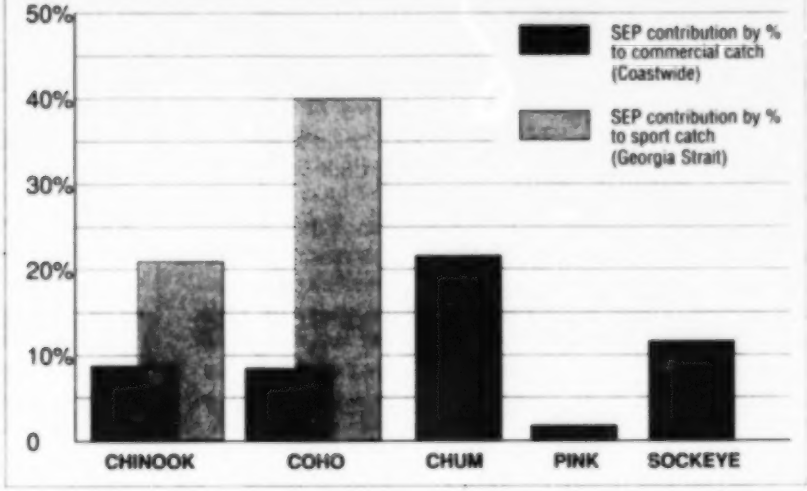
"It gives you an idea of what's out there, at least in ballpark figures; I think it's a good program," says C.F. May of Qualicum Bay.

Both fishermen agree that turning in the heads is no problem with conveniently-located depots nearby.

The commercial sampling season was the most intense to date, examining 2.3 million landed fish for adipose clips, an increase of 65 percent over commercial sampling in 1985. There was a much larger marked proportion in the fishery due to increased marking levels at U.S. and Canadian chinook and coho hatcheries, carried out in response to requests for better evaluations of fisheries contributions for Canada-U.S. Treaty allocation purposes.

Mark Recovery may be a complex program, but it's a very informative one. ■

SEP CONTRIBUTION TO 1986 SPORT AND COMMERCIAL CATCHES



SEP CONTRIBUTION TO 1986 SPORT AND COMMERCIAL CATCHES (BY AREA)

North Coast - Commercial

	Catch	SEP	SEP%
Chinook	279,000	37,000	13
Coho	1,785,000	87,000	5
Chum	2,965,205	178,629	6
Pink	17,204,681	0	0
Sockeye	1,737,382	1,229,788	71

South Coast - Commercial

	Catch	SEP	SEP%
Chinook	501,000	26,000	5
Coho	3,076,000	286,000	9
Chum	2,516,343	1,049,850	42
Pink	771,048	277,477	36
Sockeye	6,151,929	30,000	.5

Fraser River - Commercial

	Catch	SEP	SEP%
Chinook	33,000	2,000	6
Coho	44,000	11,000	25
Chum	98,950	17,147	17
Pink	1,930	0	0
Sockeye	2,667,634	0	0

Georgia Strait - Sport

	Catch	SEP	SEP%
Chinook	182,000	38,000	21
Coho	572,000	229,000	40

Screen protects migrating smolts

The significance and abundance of salmonids in B.C. in the early years is testified to by the fact that the province boasts eight rivers named "Salmon." A fish screen has now been installed on the one that empties into Kelsey Bay on Vancouver Island. The screen should make salmon and sea-run trout abundant again in this Salmon River.

The fish screen is the result of federal SEP funding and a provincial Fisheries Branch effort to compensate for the effects of a hydroelectric project which was built in the 1950s, cutting off a large part of the river for salmonid migrations. For at least ten years, the Branch has been interested in dealing with the problem and has had no doubt that a fishway would serve to give spawners access to the upper river. It seemed a poor investment, however, if the outmigrating smolts were likely to be drawn into the hydro diversion canal and on through the turbines. The screen offered a possible solution.

"We have been very happy with the mechanical performance of the screen since it was installed in October, 1986," says project engineer Jim Bomford.

The Salmon River smolt screen angles down into the hydro diversion canal, forcing smolts into a bypass route at its base. The trash screen (foreground) protects the installation from debris.

The screen is located approximately 32 kilometres upstream from Kelsey Bay, where the diversion canal leaves the river. With water flows of 42,475 litres (1,500 cubic feet) per second, the screen exceeds the size of anything similar in B.C. by quite a bit. Made of woven wire mesh and attached to a steel frame, it measures 6.7 metres by 30.4 metres (22 by 100 feet).

The problem of keeping the huge volume of water flowing through the screen without having debris jam it was solved by using mesh spaced to let small debris through. This is aided by the vibrations which the water current sets up in the screen itself. Larger debris is collected and diverted by a "trash rack" ahead on the upstream side.

The smolts, migrating downstream, are forced to a bypass at the bottom of the screen which diverts them back to the main part of the river.

Of course, the object of this $300,000 SEP-funded project was not to create a way to filter the Salmon River, it was to find a way to reintroduce salmonids.

"We have stocked the headwaters with steelhead," says Bomford, "and counts will be taken to test the efficiency of the screen. Once it's proven effective we will undertake the construction of a fishway which will allow adults to migrate up to spawn."

The project resulted from an assessment of certain facts. The system offers 35 km of stockable habitat above the Salmon River diversion structure. That equals 300,000 square metres. Both coho and steelhead stocks, native to the system, are available in sufficient quantity to begin seeding the river and production capacity is estimated at approximately 1,000 adult steelhead and 2,000 to 8,000 coho. There is also substantial local interest, largely through the Campbell River chapter of the B.C. Steelhead Society, and the cooperation of its members is expected in the area of monitoring and radio tagging.

A benefit/cost ratio was developed, using the most conservative estimates, for a 40-year period and yielded a ratio of 1.17 with the potential for an improved ratio if chinook were also introduced.

With a potential benefit of that size on a river that lies in the centre of a popular sport fishing area, the screen should more than justify its creation and work on improving access for adults is planned. ■

There's success afloat at Babine

The Community Economic Development Program (CEDP) operates projects in many B.C. communities through local contractors. These projects emphasize fish production, local training and economic development.

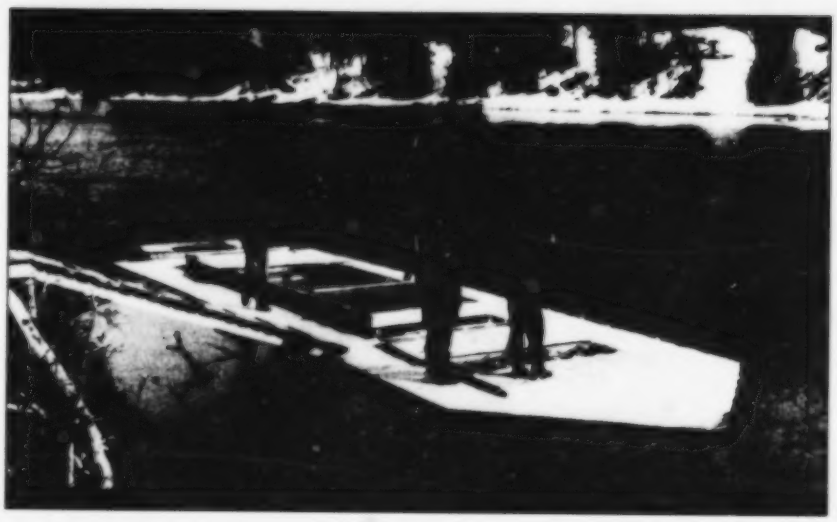
The CEDP project at Fort Babine was faced with a problem in 1984. After starting with classroom incubation, the efficiency of floating instream "cassette" incubators had been proven, but a facility for rearing fry was needed. The problem was how to keep a steady waterflow in an area where the electricity was interrupted on a regular basis.

The solution was, as with the incubators, to put the facility right into the river, where the natural waterflow would solve the supply problem. The result was a set of low-profile floats with subsurface rearing pens, tied at the shore of the river just a few metres downstream from the Babine Lake outflow.

These floating raceways were patterned on similar concepts from other locations but designed and constructed to be far more durable and to offer much greater protection from predators. The installation, first tested in 1984, is still functioning effectively.

The rearing pens themselves are constructed of aluminum panels, which can be separated for moving to remote sites. The sides are solid, but the bottom of each pen is made of perforated aluminum. This allows for waterflow and also means that there is no buildup of waste to be cleaned from the bottom of the troughs as happens with land-based rearing systems. Another benefit is the fact that the fry have access to natural as well as prepared feed.

Each rearing pen is suspended within a float that measures approximately 4.6 metres by 9.75 metres (16 by 32 feet). The floats sit low in the water so that they present a neat, inconspicuous appearance along the shoreline. The actual pens can be lifted until about 75 percent of the depth is above water. This is useful if the system must be towed to a new location through shallow water, or for reducing the depth of water for fry when first ponded.



Incubation and rearing facilities are contained in this low-profile installation at the Babine Lake outflow. Cassette incubators in prow and rearing pens behind remain ice-free in the flowing water.

Cassette incubation can be accommodated by suspending a frame within the float which can house the cassette units in the water.

The water flowing out from Babine Lake remains warm enough to keep the raceways ice-free all winter, but the installation is protected with floating log booms to minimize the impact of floating ice during spring breakup.

With this minimal protection, the rearing system withstood its first two winters undamaged. Two more floating raceways have since been built and put in operation at Fort Babine.

The pens proved so effective in this difficult location that others have been built for the Thornton Creek and Port Renfrew CEDP projects. The system is cost-efficient, with an initial cost of about $7,000 per unit, low upkeep and no electrical costs for operation. As well, the design can be modified to suit the requirements at a particular site.

The combination of cassette incubators and floating raceways can produce a very effective on-the-water hatchery, a way to overcome problems in some of B.C.'s most remote sites. ■

Teaching the teachers

Children are tomorrow's guardians of the salmonid resource. Teaching them about its value and importance to their communities and about how to preserve the resource is, in part, the function of B.C. teachers. For that reason, SEP maintains a strong liaison with the B.C. teaching profession through classroom materials and teacher workshops.

The curriculum materials, *Salmonids in the Classroom*, are marketed for the Department by the British Columbia Teachers Federation Lesson Aids Service. As well, teacher workshops are conducted to promote use of the package. In 1986-87, there were ten such workshops and more are anticipated in 1987-88.

Workshops are initiated by teachers or by a School District professional development committee inviting the SEP education coordinator to conduct an inservice session on SEP's education program. Scheduling and preliminary discussion are attended to at least a month in advance since high activity times for teachers (fall and spring) are also demanding times for Department of Fisheries and Oceans staff who may participate.

In most cases, the community advisor for the area helps conduct the session. Other personnel attending are specific to a given area and may include a fishery officer, hatchery manager, biologist or research scientist.

Most sessions follow the same pattern. The workshop familiarizes participants with *Salmonids in the Classroom* curriculum materials, provides "hands-on" activities for participants, presents various teaching strategies, introduces supplementary resource materials (audio visual presentations, posters, games, puppets, displays) and discusses the benefits of and requirements for utilizing classroom incubators.

Once the formal presentations have been made, questions are welcomed and points about the program are clarified. The workshops are usually attended by 15 to 60 teachers.

"The response has usually been very enthusiastic," says education coordinator, Linda Bernbach. "In most cases several schools come 'on stream' and *Salmonids in the Classroom* package sales reflect an upsurge of interest." ■

A child's face reveals wonder and excitement at a scale reading display – part of the *Our Resource* campaign on the Queen Charlotte Islands.

They got our message out loud and clear

Enthusiasm says it all. The *Our Resource* campaign on the Queen Charlotte Islands in 1986 was an example of the best that can happen when the fisheries message is taken directly to the public. The event involved the local Fisheries Office, the community advisor and his Public Involvement volunteer groups, the CEDP projects at Masset and Skidegate, the Offshore Division, the Mark Recovery Program, PBS and many others. Special programs were held for schoolchildren, some of whom were transported to Queen Charlotte City on board the *Tanu* — the thrill of a lifetime for the youngsters.

The generally acknowledged highlights of the two-day event included the Tracker aircraft fly-past, the

Tanu and other ship tours, the crab races, the Pallant Creek hatchery and CEDP displays and the PBS trawler display. People were fascinated by the demonstrations of how coded-wire tags are retrieved and read and by the electroshocking process. They were impressed with the various biology displays and slide shows and were delighted with the cooking demonstrations.

It was a massive production for a small community with a scattered population. The enthusiasm that motivated all the participants enabled the campaign to carry out a very ambitious program. It was rewarded by the equally enthusiastic response of the public.

"Before we even got going, a request was received from the community of Masset asking to be the site of such an event in the future," says Chris Dragseth who was District supervisor on the Queen Charlotte Islands during the campaign.

Factors that make such events work are numerous. All "Our Resource" campaigns over the program's three-year life were characterized by some common elements. All were supervised by a central Steering Committee of DFO managers. All were coordinated by local people and geared to the requirements and needs of local DFO staff. All offered the public access to displays and demonstrations as well as the chance to talk with DFO staff from various Branches. As well, each campaign was kept to a very limited budget and relied heavily on community support and volunteer labour to achieve results.

There were also major variations, created to suit the nature of the local communities.

In the Queen Charlottes, for example, the island location permitted the low-level fly-past by the Offshore Surveillance Tracker— an event that would be impossible in areas with hills or large buildings near the waterfront. The use of the *Tanu* to carry schoolchildren to the event was another aspect that was uniquely suited to the island environment.

Above all, the fact that local people were hired to coordinate these events and the fact that, where possible, the campaign tied into and supported existing local events made the level of community acceptance very high.

There were many excellent local campaigns held in a wide range of communities over the three years of the "Our Resource" program but probably none equalled the level of community acceptance and staff participation that was demonstrated in the Queen Charlotte Islands in 1986 — it was an outstanding example of how the campaigns were intended to operate, raising public awareness of the resource and of DFO's role.

Some of the comments from the Queen Charlotte Islands campaign serve to demonstrate the results that were achieved everywhere over the three years:

FROM THE PUBLIC:

"• A terrific effort.
• Enjoyable to learn more of what DFO does for us.
• Especially enjoyed the live specimens.
• Good to see children involved.
• Great way to involve the community."

FROM THE LOCAL COMMUNITY ADVISOR:

"As a community advisor on the Queen Charlotte Islands, I am lucky enough to be exposed to a lot of interest, excitement and dedication with respect to the fisheries resource. Last spring, however, these feelings were not restricted to a hard-core group of Public Involvement Program Volunteers, but were the talk of the town — indeed the entire Queen Charlottes.

The QCI Awareness campaign attracted in excess of 1300 people over the two days. Considering the population of Queen Charlotte City is only about 900, this is quite an impressive figure.

As for myself, I knew that the campaign was a success when I stopped in at Margaret's Cafe [the "unofficial town hall" in Charlotte City] the following morning— practically every conversation in the place was about fish!"

FROM THE DFO PARTICIPANTS:

"• Good questions, positive responses.
• Public concern shown for the resource.
• Gearing it to children created more organizational work, but that's a real cornerstone."

Noons Creek is a backyard miracle

"One of the advantages to working on creeks that have been devoid of any salmon is that you can tell exactly what your efforts have produced," says community advisor Gary Taccogna.

Noons Creek is an outstanding example of what he is talking about.

When Brian Waite first began with a streamside incubation box in 1979, there were no coho in the creek at all. An avid fly-fisherman, Waite had noticed the lack of good salmon fishing close by. He heard about the Public Involvement Program and decided to get involved. So he contacted Bryan Allen, who was then the community advisor in the area, and built an incubation box. The project was a success.

In 1986, numerous fish from the project were caught in the commercial and sport fisheries and still some 300 spawners made it back to the creek. There was just one irony; Brian Waite was not one of those happy fishermen out in Burrard Inlet.

"I've lost my enthusiasm for catching fish now that I know what it takes to produce them," says Waite. "Now my fun is seeing them come back to spawn."

It doesn't take much space to raise up to 20,000 juvenile coho for release. Waite's project consists of a stream-fed incubation box near the creek, a holding trough nearby and an attractive fish pond on the lower lawn.

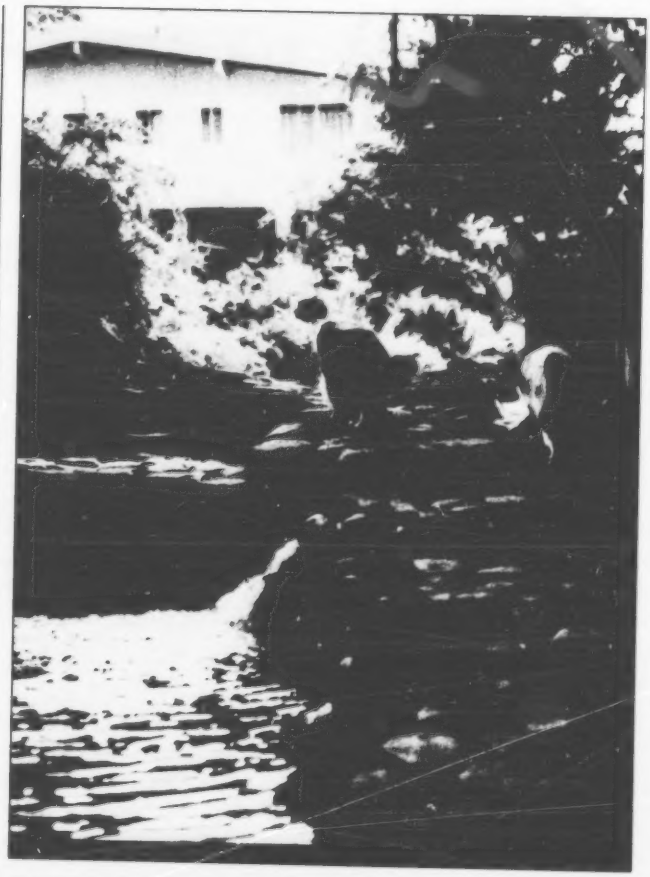
The pond is no larger than many goldfish ponds, but it is a great deal more productive. The fry that are released from Noons Creek are descended from Capilano and Seymour stocks, but the Noons Creek fish are returning at up to three times the typical adult weight for coho at the Capilano.

"The productivity of this estuary may be the deciding factor," says Taccogna. "It is much richer than the Capilano estuary."

"Water quality in the creek is excellent," says Waite. "It was one of the first things Bryan Allen checked out when I wanted to start the project."

The tender care and generous feedings that the Noons Creek fry get prior to their release probably contribute, too. These fish are the pride of the neighborhood.

In 1984, when the first real returns arrived, there were some problems with poachers taking the fish. It is an urban stream, after all, and very accessible. Then a huge run (estimated at up to 700 fish) ascended the little creek in 1985, and things got worse. People lined the banks, stoning, clubbing and snaring the fish. Fortunately, the media got the word out quickly. People were warned to respect the spawners and volunteer help appeared. Neighbours, the local fire department and fish and game club members from Port Coquitlam and the North Shore arrived. With these friends patrolling the shoreline, the fish were able to spawn and the following spring found their offspring feeding happily in the creek — ready to move downstream and become more miracle fish from little Noons Creek. ■



Brian Waite's streamside backyard is secluded, attractive and highly productive. As many as 700 coho have returned to this site!

Science examines the Fraser

The lake fertilization program has been a significant component of SEP since the program began. At first, its focus was on coastal lakes, but in the past two years there has been a need to investigate lakes on the Fraser system to see if fertilization can be effective there.

Research scientists from the lake enrichment program began studies of interior lakes in 1984-85 in an effort to learn about their productivity, physical-chemical characteristics and fish-forage interactions. This information will be essential if SEP is to apply lake fertilization to enhance the Fraser River sockeye runs — runs which have incredible potential. Many of the major Fraser River sockeye runs follow a four-year dominance cycle with a dominant year, followed by a lesser subdominant year, and two years of very low production (returns), then the next year of dominance. The researchers feel that plankton may play a role in regulating this cycle.

The questions that arise regarding the cyclical characteristic of Fraser sockeye must be answered if a suitable enhancement strategy is to be developed. Factors that limit sockeye production in the interior of B.C. may be more clearly identified as studies proceed. Volume of feed available to young fish could be one factor; type or size of food is another possibility. The physical limitations on numbers of spawners that can pass through areas like Hells Gate may also play a part in determining the ultimate productivity of the region. Research over the next few years will be aimed at trying to find answers to at least some of these important questions.

Ken Shortreed and Timber Whitehouse are part of a research team on Chilko Lake. Tests will determine whether lakes on the Fraser River will benefit from fertilization.

The impact of cyclic dominance on the lake production capacity will be studied on Shuswap Lake for the next four years. The arrival of the dominant-year run of more than two million spawners in 1986 marked the high point of the cycle.

"This study will follow the cycle and determine if the type and quality of feed or the length of the food chain affect the productivity and rearing capacity of the interior lakes for sockeye," says Dr. John Stockner.

"We have to determine the actual carrying capacity of the system before we attempt to increase production through lake enrichment," he says, adding that the biological systems affecting salmon forage in these lakes seem to be more complex than in coastal lakes.

Chilko Lake, in the Chilcotin Range, came under study in 1985. The lake fertilization team hopes to start field trials there with some shoreline fertilization in 1988 — the year of the dominant run for Chilko. Observation of the results will form the basis for "real world" conclusions about what types of plankton are needed, in what numbers and in what parts of the lake in order to produce results.

"We have to get food into the sockeye's mouth at the right time and place," says Stockner. Ultimately, only trying it will prove whether that is happening.

Quesnel Lake is also under study. This lake was, at one time, the best sockeye producer in the entire Fraser system but it has suffered over the years. A gold mining operation in the early 1900s led to a dam on the Quesnel River and the run was nearly wiped out. It has taken more than half a century, but the Quesnel system has finally recovered to the extent that a dominant year is beginning to develop. Spawning channels and fishlifts are being considered as ways to increase fry production. With increased production, enrichment of Quesnel Lake may prove to be beneficial and add significantly to adult returns.

Methods for lake fertilization are also being reviewed; the researchers hope that the use of liquid fertilizers may soon prove economically feasible. The liquids are more costly to buy, but there may be offsetting savings in the efficiency that could be attained.

The studies being undertaken now may contribute to substantial increases in the Fraser sockeye runs by the end of the century. ■

Research into ocean survival

The Marine Survival of Salmon Program (MASS) involves scientists and support staff from the Biological Sciences and the Physical and Chemical Sciences branches of Fisheries and Oceans and from the Canadian Wildlife Service. The program's objective is to learn more about how ocean conditions affect the distribution and the survival of salmon during their first summer in the ocean. Existing information suggests that oceanic events are linked to dispersal and survival, and ultimately to the availability of adult salmon to the fisheries. The MASS program is a concerted attempt to identify these relationships more precisely.

The program is comprised of four projects. The first is to measure the residence time and survival of sockeye, coho and chinook salmon smolts in Alberni Inlet and Barkley Sound in relation to their food supply, and to tide and wind-driven circulation and mixing within Barkley Sound. Coho and chinook released from Robertson Creek hatchery will also be investigated.

Analysis of historic variation in sockeye returns to Barkley Sound has revealed that marine survival is correlated with water temperature at Amphitrite Point at the time the smolts are migrating through Barkley Sound and up the west coast of Vancouver Island. Survival is good when water temperature is low and poor when water temperature is high. Similarly, Carnation Creek coho survival appears related to temperature and salinity at Amphitrite Point. An important part of the investigation will study food production and concentrations within Barkley Sound.

MASS IS SEEKING HOW OCEANIC CONDITIONS AFFECT THE DISTRIBUTION AND SURVIVAL OF SALMON DURING THEIR FIRST OCEAN YEAR.

The second project within the MASS program is to measure the residence time and survival of chinook and coho on Swiftsure and Amphitrite banks in relation to currents and eddies that create or destroy favourable feeding conditions on the banks.

Past work showed that juvenile coho and chinook congregate over the banks, at least during the spring and summer. Why these areas are attractive, and what the relationship is between gathering on these banks and survival is unknown. Eddies and vertical mixing are induced when the tide flows back and forth over the banks, so the banks may be places where it is efficient for the young fish to gather, or they may be places where food production is high and food particles are concentrated.

The third project is to measure the northward dispersal and survival of Alberni Inlet sockeye during their northward migration along the west coast of Vancouver Island.

During the summer and the winter, when wind patterns are relatively stable along the coast, there is a well-developed northward flowing current along the inner continental shelf off the west coast of Vancouver Island. Sockeye smolts may use this northward flowing current as a directing and transport mechanism. At certain times eddies and filaments form along the seaward boundary of the northward flowing water. These disruptions could reduce sockeye survival if their migratory behaviour is affected.

The fourth project is to measure mortality caused by predation on young sockeye, coho and chinook. The work on predation will be closely coordinated with the investigations of dispersal, aggregation, and migration of salmon smolts and juveniles. Investigation of predatory fishes and of seabird and marine mammal predation will be initiated in Alberni Inlet and Barkley Sound and on seabird predation on Swiftsure and Amphitrite banks in 1987.

The MASS program is scheduled to run for three years. Relationships that appear promising will, however, be pursued beyond the three-year time frame. Information gathered by the program will permit more accurate estimates of salmon survival rates. These estimates will benefit fisheries managers and provide guidelines for future enhancement efforts. ■

How to read SEP fish production table (p.14)

This table shows the number of adult fish expected during the years 1988 to 1990, (depending on the species) to result from 1986 releases, and the anticipated contribution to catches. For example, Big Qualicum project released 25,676,518 chum juveniles in 1986. These should result in an adult population of 179,736 of which 82,679 will be caught in the various fisheries.

1986 SEP FISH PRODUCTION (by project)

PROJECT	SPECIES	JUVENILES RELEASED	EXPECTED ADULT PRODUCTION	EXPECTED CANADIAN CATCH
• ENHANCEMENT OPERATIONS				
BIG QUALICUM PROJECT	Chum	25,676,518	179,736	82,679
	Coho	2,984,288	85,345	60,563
	Chinook	6,660,720	131,414	89,362
	Steelhead	83,232	2,337	1,169
BIRKENHEAD HATCHERY	Chinook	108,979	272	82
	Steelhead	7,805	78	47
CAPILANO HATCHERY	Coho	756,602	60,786	32,126
	Chinook	3,066,664	52,133	41,759
	Steelhead	36,534	182	91
CHEHALIS HATCHERY	Chum	16,964,639	288,398	121,822
	Coho	1,033,675	103,368	74,037
	Chinook	370,081	6,291	4,982
	Steelhead	110,294	4,412	2,647
	Cutthroat	12,709	1,271	853
CHEMAINUS HATCHERY	Coho	86,500	865	616
	Chinook	236,926	4,739	3,223
CHILLIWACK HATCHERY	Chum	4,112,484	69,912	29,532
	Coho	1,944,359	194,436	139,994
	Chinook	694,603	11,804	9,349
	Steelhead	167,209	5,344	3,207
CLEARWATER HATCHERY	Coho	253,210	5,064	3,627
	Chinook	754,689	5,660	1,698
CONUMA HATCHERY	Chum	19,757,759	335,882	218,323
	Coho	237,800	16,196	9,232
	Chinook	996,755	13,955	7,368
DEVEREUX PILOT	Coho	86,801	1,168	617
	Chinook	232,693	1,745	1,398
EAGLE HATCHERY	Coho	848,541	19,594	14,035
	Chinook	722,633	6,487	1,946
FULTON PROJECT	Sockeye	142,200,000	1,407,780	729,934
INCH HATCHERY	Chum	8,094,268	137,602	58,124
	Coho	327,087	32,552	23,315
	Cutthroat	32,053	2,975	1,993
JONES CHANNEL	Chum	668,040	4,676	1,975
	Pink	465,520	6,983	3,447
KITIMAT HATCHERY	Chum	4,928,891	83,792	46,086
	Coho	796,882	79,688	38,848
	Chinook	1,606,341	19,277	11,277
	Steelhead	55,681	1,670	835
	Cutthroat	2,680	268	180
LITTLE QUALICUM PROJECT	Chum	9,563,555	93,480	43,001
	Chinook	1,586,622	31,732	21,578
	Steelhead	29,663	1,187	594
	Cutthroat	4,039	404	271
NITINAT HATCHERY	Chum	17,587,830	285,910	185,842
	Coho	58,704	1,761	967
	Chinook	4,333,329	59,244	31,281
PALLANT/MATHERS	Chum	11,679,186	210,630	104,262
HATCHERY	Coho	405,772	10,144	4,516
PINKUT PROJECT	Sockeye	49,070,000	485,793	251,884
PUNTLEDGE HATCHERY	Chum	5,430,947	88,826	40,860
	Pink	3,182,710	73,202	43,921
	Coho	2,593,103	99,193	70,675
	Chinook	3,594,248	71,884	48,881
	Steelhead	92,991	3,175	1,588
QUESNEL HATCHERY	Coho	17,583	527	377
	Chinook	1,767,747	12,295	3,688
QUINSAM HATCHERY	Pink	7,375,938	136,622	81,973
	Coho	1,301,724	122,167	87,044
	Chinook	3,164,230	63,285	43,034
	Steelhead	46,205	1,078	539
ROBERTSON HATCHERY	Coho	1,459,566	72,978	40,065
	Chinook	8,320,077	115,726	61,103
	Steelhead	255,828	7,317	6,533
SHUSWAP HATCHERY	Chinook	250,669	1,623	487
SNOOTLI HATCHERY/	Chum	6,913,385	106,778	58,141
	Coho	155,093	3,102	2,194
	Chinook	2,024,451	15,184	8,389
	Steelhead	101,597	650	325
	Cutthroat	13,154	184	123

PROJECT	SPECIES
SPIUS HATCHERY	Coho
	Chinook
TENDERFOOT HATCHERY	Coho
	Chinook
	Steelhead
WHITEHORSE HATCHERY	Chinook
• COMMUNITY ECONOMIC DEVELOPMENT	
BARRIERE	Coho
BELLA BELLA	Chum
	Coho
DEADMAN	Chinook
CHEHALIS	Chum
	Chinook
CLAYOQUOT	Sockeye
	Coho
COWICHAN	Chum
	Coho
	Chinook
FORT BABINE	Coho
	Chinook
FORT ST JAMES	Chinook
HARTLEY BAY	Coho
KINCOLITH	Coho
	Chinook
KISPIOX	Coho
	Chinook
	Steelhead
KITSUMKALUM	Coho
KLEMTU	Chum
	Pink
KYUQUOT	Chum
	Coho
MASSET	Chinook
NANAIMO	Chum
	Coho
	Chinook
NIMPKISH	Sockeye
	Chum
	Coho
	Chinook
OWEEKENO	Chinook
PENNY	Chinook
PORT HARDY-QUATSE	Chum
	Pink
	Coho
	Steelhead
PORT HARDY-STEPHENS	Chum
	Coho
POWELL RIVER	Chum
	Pink
	Coho
SAN JUAN	Chum
	Coho
	Chinook
SECHELT	Chum
	Coho
	Chinook
SEYMOUR	Coho
	Steelhead
SKIDEGATE	Chum
	Coho
SLIAMMON	Chum
	Coho
TERRACE	Chinook
	Steelhead
THORNTON	Coho
	Chinook
TOBOGGAN	Steelhead
• FISHWAYS AND UNMANNED CHANNELS	
	Pink
	Chum
	Coho

JUVENILES RELEASED	EXPECTED ADULT PRODUCTION	EXPECTED CANADIAN CATCH
111,300	2,226	1,594
454,710	4,725	1,417
475,669	39,330	20,786
246,891	4,197	3,362
107,095	1,511	756
83,890	210	8
121,321	3,062	2,193
1,214,210	23,022	12,535
11,439	1,144	809
7,550	57	17
1,630,847	11,416	4,822
61,661	462	366
5,930	53	32
26,546	736	404
190,886	2,291	1,054
314,770	3,147	2,242
63,886	479	326
101,476	5,136	2,343
123,331	1,960	813
111,763	838	251
156,125	4,683	510
64,482	6,448	3,176
138,902	1,102	327
77,124	4,446	2,029
158,896	2,292	951
5,423	35	18
6,429	129	59
184,680	3,509	1,911
10,000	150	90
17,000	119	77
4,500	36	21
95,253	1,347	507
354,891	4,334	1,994
219,887	2,199	1,567
369,620	7,393	5,027
3,037,000	27,333	15,306
900,458	13,372	6,151
6,952	139	94
263,308	4,802	3,058
125,461	1,257	859
72,290	181	54
70,500	846	389
2,107,450	31,613	18,968
174,700	2,258	1,528
67,529	2,379	1,190
1,576,600	11,036	7,173
199,400	2,732	1,557
123,200	1,478	650
130,500	1,958	1,449
191,530	3,968	2,097
2,430	41	27
120,000	3,600	1,976
29,700	416	220
38,719	658	290
73,187	7,318	3,868
80,489	1,635	1,309
93,933	2,652	1,401
30,264	633	317
37,984	594	294
30,702	818	364
920,000	11,040	4,858
62,089	2,710	1,432
324,659	3,907	1,621
15,296	153	77
181,390	6,336	3,478
44,000	616	325
138,900	1,028	514
8,754,875	731,323	438,794
210,000	1,470	647
32,500	260	137

PROJECT	SPECIES	JUVENILES RELEASED	EXPECTED ADULT PRODUCTION	EXPECTED CANADIAN CATCH
• SMALL PROJECTS UNIT				
ALOUETTE RIVER	Chum	1,190,000	20,230	8,545
	Pink	340,000	5,100	2,517
	Coho	14,500	1,450	1,039
	Steelhead	43,143	1,726	1,036
	Cutthroat	30,504	3,051	2,043
B.C. RAILWAY CHANNEL	Chum	1,000,000	14,000	5,914
BILLY HARRIS CHANNEL	Chum	1,500,000	21,000	8,871
	Coho	11,240	1,686	1,208
CHILQUA SLOUGH	Chum	500,000	7,000	2,957
	Coho	1,200	180	129
COLONIZATION	Coho	422,290	4,224	3,009
ED LEON CHANNEL	Chum	1,750,000	24,500	10,349
	Coho	8,700	1,305	935
HICKS CREEK POND	Chum	25,000	350	148
HOPEDALE SLOUGH	Chum	150,000	2,100	887
	Coho	4,000	600	430
JUDD SLOUGH	Chum	2,600,000	36,400	16,016
	Coho	7,800	1,170	618
KITSUMKALUM CHANNEL	Sockeye	250,000	2,475	1,283
LOWER PARADISE CHANNEL	Chum	350,000	4,900	2,156
	Coho	1,300	195	103
MAMQUAM CHANNEL	Chum	1,500,000	21,000	9,240
	Pink	750,000	18,750	13,875
	Coho	4,500	675	357
PEACH CREEK	Chum	1,500,000	21,000	8,871
	Coho	4,500	675	483
RAILROAD CREEK	Chum	350,000	4,900	2,070
	Coho	250	40	29
RYDER CREEK	Chum	150,000	2,100	887
SEABIRD CHANNEL	Sockeye	11,232	111	52
UPPER PARADISE CHANNEL	Chum	1,300,000	18,200	8,008
	Coho	13,300	1,995	1,054
VANCOUVER BAY	Chum	34,930	584	257
	Pink	727,398	10,911	8,074
	Coho	95,823	3,323	1,756
	Chinook	24,748	262	210
	Steelhead	31,000	310	155
WESTHOLME SIDE CHANNEL	Chum	1,500,000	21,000	9,660
	Coho	1,300	195	139
WORTH CREEK	Chum	350,000	4,900	2,070
	Coho	8,000	1,200	859
• PROVINCE OF B.C.				
FRASER VALLEY TROUT FARM	Steelhead	322,636	3,871	2,269
	Cutthroat	73,498	4,220	2,827
LOON CREEK HATCHERY	Chinook	108,700	272	82
	Steelhead	40,790	1,224	734
VANCOUVER ISLAND TROUT FARM	Steelhead	342,725	8,436	4,218
	Cutthroat	20,269	2,027	1,358
• PUBLIC INVOLVEMENT PROGRAM (OVER 220 PROJECTS)				
	Chum	1,406,439	15,751	7,398
	Pink	30,000	450	270
	Coho	2,379,718	50,313	29,658
	Chinook	1,060,181	9,813	5,087
	Steelhead	38,251	798	457
	Cutthroat	11,541	1,154	773
	Rainbow	8,000	51	31
• LAKE ENRICHMENT - including baseline production				
DEVON LAKE	Sockeye	32,712	1,472	589
GREAT CENTRAL LAKE	Sockeye	10,231,020	460,396	280,842
HENDERSON LAKE	Sockeye	4,186,950	188,413	114,932
KENNEDY-CLAYOQUOT	Sockeye	500,000	22,500	13,725
LONG LAKE	Sockeye	6,631,800	298,431	164,137
NIMPKISH-WOSS LAKES	Sockeye	3,543,410	159,453	89,294
QCI LAKES	Sockeye	1,629,928	73,347	38,158
SPROAT LAKE	Sockeye	6,968,650	313,589	191,289
BONILLA L./CURTIS L./KITLOPE L./MORICE L.		N/A	N/A	N/A
• EX-SALMON COMMISSION CHANNELS	Sockeye	29,939,735	283,093	132,176
	Chum	1,978,135	13,847	5,849
	Pink	15,879,497	389,162	192,083

1986 SEP FISH PRODUCTION (by program)

PROGRAM AREA	PROJECTS	SPECIES	JUVENILES RELEASED	EXPECTED ADULT PRODUCTION	EXPECTED CANADIAN CATCH
ENHANCEMENT OPERATIONS *(hatcheries/spawning channels)*	27	Sockeye	191,270,000	1,893,573	981,818
		Chum	131,377,502	1,885,622	990,647
		Pink	11,024,168	216,807	129,341
		Coho	15,934,259	949,318	624,533
		Chinook	41,277,948	633,882	395,672
		Steelhead	1,094,134	31,074	19,679
		Cutthroat	64,635	5,102	3,420
			392,042,646	**5,615,378**	**3,145,110**
COMMUNITY ECONOMIC DEVELOPMENT PROGRAM *(community hatcheries/ seapens, spawning channels)*	30	Sockeye	3,042,930	27,386	15,338
		Chum	7,262,405	83,756	42,225
		Pink	2,247,950	33,721	20,507
		Coho	2,237,982	63,697	33,148
		Chinook	2,070,769	28,744	16,031
		Steelhead	257,412	4,228	2,116
			17,119,448	**241,532**	**129,365**
SMALL PROJECTS UNIT *(side channels/habitat/ spawning/joint venture hatcheries)*	20	Sockeye	261,232	2,586	1,335
		Chum	15,749,930	224,164	96,906
		Pink	1,817,398	34,761	24,466
		Coho	598,703	18,913	12,448
		Chinook	24,748	262	210
		Steelhead	74,143	2,036	1,191
		Cutthroat	30,504	3,051	2,043
			18,556,658	**285,773**	**138,599**
PROVINCE OF B.C. *(hatcheries)*	3	Chinook	108,700	272	82
		Steelhead	706,151	13,441	7,221
		Cutthroat	93,767	6,247	4,185
			908,618	**19,960**	**11,488**
PUBLIC INVOLVEMENT PROGRAM *(habitat/hatcheries/ incubation boxes)*	220+	Chum	1,406,439	15,751	7,398
		Pink	30,000	450	270
		Coho	2,379,718	50,313	29,658
		Chinook	1,060,181	9,813	5,087
		Steelhead	38,251	798	457
		Cutthroat	11,541	1,154	773
		Rainbow	8,000	51	31
			4,934,130	**78,330**	**43,674**
LAKE ENRICHMENT PROGRAM	12	Sockeye	**33,724,474**	**1,517,605**	**892,967**
FISHWAYS AND UNMANNED CHANNELS	3+	Chum	210,000	1,470	647
		Pink	49,167,375	737,511	442,524
		Coho	32,500	260	137
		Chinook	25,000	50	40
			49,434,875	**739,291**	**443,348**
EX-SALMON COMMISSION CHANNELS	5	Sockeye	29,939,735	283,093	132,176
		Chum	1,978,135	13,847	5,849
		Pink	15,879,497	389,162	192,083
			47,797,367	**686,102**	**330,108**
TOTAL PRODUCTION			**564,518,216**	**9,183,971**	**5,134,659**

1986 SEP FISH PRODUCTION (by species)

Sockeye	258,238,371	3,724,243	2,023,634
Chum	157,984,411	2,224,610	1,143,672
Pink	80,166,388	1,412,412	809,191
Coho	21,183,162	1,082,501	699,924
Chinook	44,567,346	673,023	417,122
Steelhead	2,170,091	51,577	30,664
Cutthroat	200,447	15,554	10,421
Rainbow	8,000	51	31
TOTAL PRODUCTION	**564,518,216**	**9,183,971**	**5,134,659**